would continue to be propagated in the great circle coinciding with its first direction, unless accidental causes should alter its course.

VIII. *On the existence of a Zone of least disturbance in the Shell.*

The author investigates analytically the position of this zone, and from the results of his investigation, points out the conditions under which it will exist, and also the consequences that will follow from its non-existence.

IX. This section is devoted to the calculation of some of the constants contained in the formulæ of the preceding sections.

The following are the geological deductions from the foregoing investigations:—

1. The stability of the axis of rotation of the earth will progressively increase during the process of solidification.

2. By employing the values of the constants obtained in Section IX., it appears that the thickness of the earth's crust cannot be less than 18 miles, and cannot exceed 600 miles.

3. The earth's primitive ellipticity, when entirely fluid, was less than its present ellipticity; but their difference may be neglected.

4. If a zone of least disturbance existed near the parallel of mean pressure, the directions of great lines of elevation should be in general parallel, or perpendicular to the equator. Its non-existence there, which observation seems to show, proves at least that the variable pressure did not predominate over the constant. Since, as yet, observation goes to prove that such a zone does not exist on the earth's surface, we must provisionally conclude that the constant pressure greatly predominated over the variable, and, consequently, that the directions of the lines of elevation must be comparatively arbitrary.

5. That great friction and pressure exist at the surface of contact of the nucleus and shell, is shown from the conclusions arrived at in Section IV., combined with the important result obtained by Mr. Hopkins in his second memoir on Physical Geology (Phil. Trans. 1840, p. 207).

6. The amount of elastic gases given off from the surface of the nucleus rapidly decreases as the thickness of the shell increases.

7. The expression obtained for the variation of gravity shows that, if the angular velocity of rotation of the earth remained unchanged, the waters on its surface would tend to accumulate towards the equator, for the increase of gravity, in going from the equator to the poles, would be less according as the shell's thickness increased.

March 22, 1849.

The Very Rev. The DEAN OF WESTMINSTER, Vice-President, in the Chair.

A paper was read, entitled "An Account of the Aurora Borealis

of the 17th of November 1848." By the Rev. Charles F. Watkins. Communicated by the Marquis of Northampton, V.P.R.S.

The author states that, "About half-past 7 P.M. the sky assumed the appearance which it usually does immediately preceding the action of what are called the Northern Lights. In the northern half it was quite clear for about forty-five degrees from the meridian, of a pale blue, and covered with a faint light, such as generally ushers in the moon at her rising. Towards the east and west this light gradually diminished, and south of those cardinal points the dimness as gradually thickened.

"Soon after eight the coruscations began by the usual lambent strokes of a shining filmy matter, like the sudden shooting forth and instantaneous retroceding of a serpent's tongue. They commenced in the north-east, and shot upwards in an angle of about 70 degrees of inclination towards the south, and to about 60 degrees in length, more or less, leaving the sky clear to the north, and in a manner gradually chasing the clouds, upon whose receding bounds they glanced further to the south.

"In a short time the same kind of electrical action commenced in the north-west quarter of the heavens, and continued simultaneously with that from the north-east, both increasing in rapidity, intensity and depth of colour; till at length an entire hemispherical arch of crimson and purple, but with uneven edges, spanned the heavens from east to west, and remained suspended there for several minutes. By degrees this arch broke up into separate masses of highly and parti-coloured clouds, resembling those which are seen floating about after the setting of an ardent sun. Meanwhile the lighter coruscations continued,—now glancing upwards on the northern edges of the clouds, which were still slowly receding to the south, and now shooting up beneath them as they steadily retreated. At the same time others of a redder hue played now alternately, and now in union with them.

"About a quarter past nine an extraordinary phenomenon occurred, such as I never before witnessed; the zenith assumed the appearance of a crimson coronary apex to distinct but connected bands of various shades of crimson, green and purple, in which the crimson prevailed, flowing down from thence like a canopy, encircling the upper portion of the heavens, which to me presented the inside view of a ribbed and vaulted cupola. By degrees this beautiful creation dissolved, and the body of clouds, against which the electrical forces seemed to have been in hostile pursuit, fled away to the south; the elementary action ceased: a silent calm returned, and nothing but the tranquil light, still shining in the north, remained to indicate the recent scene. The wind had blown with a fresh but steady breeze from the north-west, during the continuance of the phenomenon.

"Without entering at present into any disquisition upon the causes, I will now state the meteorological results which I immediately anticipated and have seen to follow these atmospheric phenomena.

"I have observed, and have stated my observations for some years

past, that the certain result of all meteoric coruscations and iridescences in the sky, is a fall of rain, snow or hail,—on this general principle, that the condensation of the crystalline particles of floating vapours which ensues upon electrical action, must be followed by precipitation; and these coruscations and iridescences are both the reflected evidences of such condensation of crystalline matter, and therefore the harbingers of such precipitation. It is the case with solar and lunar rainbows, falling stars, mock-suns, halos, lightning, aurora, and that undefined pearly lustre which sometimes appears in the neighbourhood of the sun.

"Accordingly, on the following morning, Saturday the 18th, I found the barometer had sunk considerably, and the wind had veered round from north-west to south-west, against the course of the sun, both in general, and especially when united, the forerunners of rain. Accordingly at 2 o'clock P.M. a smart shower came on in Northampton, but was of short duration. At 9 P.M. a heavier shower was experienced at Brixworth; and in the course of the night, but I cannot say at what hour, I was awakened to a still heavier shower; but the quantity of rain that had fallen did not seem to have affected the ground much on the following morning, and therefore I conclude that it was not great.

"Sunday the 19th was fine and bright; the wind went up to the westward, and the barometer rose rapidly—a general indication of an early change. Towards morning of Monday the 20th, another shower fell, and the wind went back to the south-west with a falling barometer. In such cases I generally find that rain ensues about midday, or at least when the wind and sun meet in the south-west. But on this occasion it continued blowing strong all the day, and for some time in the night with increased violence. But at last the wind fell, and was succeeded for awhile by heavy rain, thus verifying my anticipations on this particular occasion, and the general theory which I have discussed."

March 29, 1849.

GEORGE RENNIE, Esq., Treasurer, Vice-President, in the Chair.

The following papers were read:—

1. "Examination of the Proximate Principles of some of the Lichens."—Part II. By John Stenhouse, Esq., F.R.S.

Gyrophora pustulata.

The author states that this lichen, which is the "Tripe de Roche" of the Canadian hunters, has been long employed by the manufacturers of archil, though the quantity of colouring matter contained in it is by no means considerable, being little more than a twelfth of that in the *Roccella Montagnei*. The *Gyrophora pustulata*, on which the author operated, was brought from Norway, where it is